Title

Effects of cognitive biases and heuristics on mining equipment selection on platinum mines in Rustenburg, South Africa.

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DECLARATION

I, Thabo Ramaphakela, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Thabo Ramaphakela

Signed at .....

On the 21 day of June 2023

3 ACKNOWLEDGEMENT

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4 SUPPLEMENTARY INFORMATION

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ABSTRACT

The purpose of this study is to investigate the effects of cognitive bias and heuristics on mining equipment selection, on platinum mines in Rustenburg South Africa. Shaft Engineers, Procurement Manger and Engineering Managers from Rustenburg platinum mines were the participants in the study.

A total number of eight interviews were conducted on five mines around Rustenburg. The exploratory design and qualitative approach were used in the study. Interpretive phenomenological and semi-structured interviews approach were used. Open ended question were asked, these kinds of questions allowed the participants to engage and participate effectively. The information was analysed using a thematic approach.

Heuristics and bias across life span of a decision maker, have influence in the decision-making ability of the decision maker. Engineering Managers and Shaft Engineers are not immune from cognitive bias, heuristics, and their effects during mining equipment selection. Managers must be rational when selecting mining equipment, but the research indicate that under limited time and lack of information, managers turn to cognitive biasness and heuristics ("Mind shot cut") during decision making.

The study shows that the participants with more experience used fewer heuristics than those with less, especially when the stakes were high. These support that the decision maker who have high cognitive level (Knowledge) use their intuitive "gutfeel" to take a calculated risk. The "bounded rationality" of decision-makers has been acknowledged by decision theories, as having cognitive constraints. People tend to attribute meaning to changes based on their own set of beliefs, perspectives, and conceptions.

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DEFINITION OF KEY TERMS

1. **Mining Equipment**: Specialized underground mining equipment such as trucks, loaders and diggers excavate the material, which is then hauled to the surface with skips or lifts for processing (RSA, 1996).
2. **Mining Safety**: Involves managing mining operations and events to minimize hazards, risks, and accidents (RSA, 1996).
3. **Trackless Mining Machine (TMM)**: "Self-propelled mobile machine used for mining, transport, or other mine operations. New standards for trackless mobile machines prevent collisions (RSA, 1996)".
4. **Section 21 of Mine and Health Safety Act 1996**: "Manufacturer's and supplier's duty for health and safety. designs, manufactures, erects or installs any article for use at a mine must ensure, as far as reasonably practicable, that ergonomic principles are considered and implemented during design, manufacture, erection or installation (RSA, 1996)".
5. **Appointment 2.13.1**: "In terms of Regulation 2.13.1, in force in terms of Schedule 4 of the Mine Health and Safety Act, 29 of 1996 the appointed must take all reasonable measures to ensure the Safety and Health of employees and keep proper discipline (RSA, 1996)".

Figures:

Tables:

1 INTRODUCTION TO THE RESEARCH

1.1 Introduction

Decision making theory and human behavioural theory have pivoted from Simon's bonded rational that human being have infinite cognition and their environment is ever changing. However, decision makers are expected to maximise their utilities when making a decision under circumstance where there is a limited information or information over load, and the decision makers is under pressure.

More generally human behavioural theories have received a growing attention, as can be seen from Simon. In particular, the researches like Tversky (1972) have highlighted that decision maker's behaviours are not rational and sometimes are inconsistent with the logic. This detachment from logic is not accidental but it is related to numerous cognitive biases and Heuristics, which interfere with the decision process of economic agents, often leading them into errors.

The study investigate the effects, presents and prevalent of cognitive biases and heuristics during decision making: available heuristics, representative heuristics, framing heuristics, small number bias, falls of sense(Illusion) of control bias, planning fallacy and sense of control.

The paper will firstly give background and context to the study which are: a brief history of South African mining industry, the background of platinum mines in Rustenburg, the genesis of mining equipment's in South Africa, mining equipment selection process and strategic decision. The study then describes the methodology used, which is based on a questionnaire consisting of 21 questions. The obtained data are then analysed, taking into account both the attributes of the participants and the qualitative literature. Finally, we propose conclusions mainly focused on the differences that emerged from the literature compared to the findings on the study.

1.2 Background and context

1.2.1 South African Mining Industry

The discovery of precious metals such as diamonds and gold in South Africa was a turning point in the country's development. South Africa's industrialisation was propelled by its prolific gold mining industry and its access to low-cost energy generated by the country's vast coal reserves (Harrison and Zack 2012). While the mining sector's contribution to GDP (Gross domestic product) has decreased over the past 50 years, it is still seen as important by the government due to the large amount of foreign currency it generates (38% of South Africa's exports in 2022) and the large number of people it employs (over 475 561 in 2022) (6% of the total number of formally employed people in South Africa) (Pocket book, MCSA, 2022).

The mining industry is expected to boost exports and income, resulting in significant cash for the government, under the 2030 National Development Plan (National Planning Commission 2012). The mining industry is still a primary sector, with significant spending power and a multiplier effect on other businesses and sectors in South Africa (MCSA, 2022)

Mining's impact on the country's topography is as significant as its economic benefits, cities and towns have popped up near mines as people migrate to emerging towns in search of work and the promise of a better life (Oranje et al., 2020). The Gauteng City Area stood out as the most developed of its kind. Other regions have developed over the past three decades, cantering on Platinum Group Metals (PGMs), and this one is identified as the Platinum Belt, which includes three branches, Eastern, Northern, and Western Limbs. Rustenburg is the most important commercial hub in the Platinum Belt's Western Limb (Oranje et al., 2020).

1.2.2 Platinum mining in Rustenburg

When geologist Dr. Hans Merensky found a large portion of a notably platinum-rich, on a farm a few miles east of the city centre in the mid-1920s, that was the beginning of platinum mining in the Rustenburg area (Oranje, Nel & Van Huyssteen, 2021). In the beginning, the metal was mostly used for making jewellery. Mining activities expanded dramatically during World War Two, to fulfil the surging demand for platinum, which was used extensively in the war effort. In the 1950s, platinum mining flourished in response to rising demand from the petroleum industry and other sectors (Dumett, 1985).

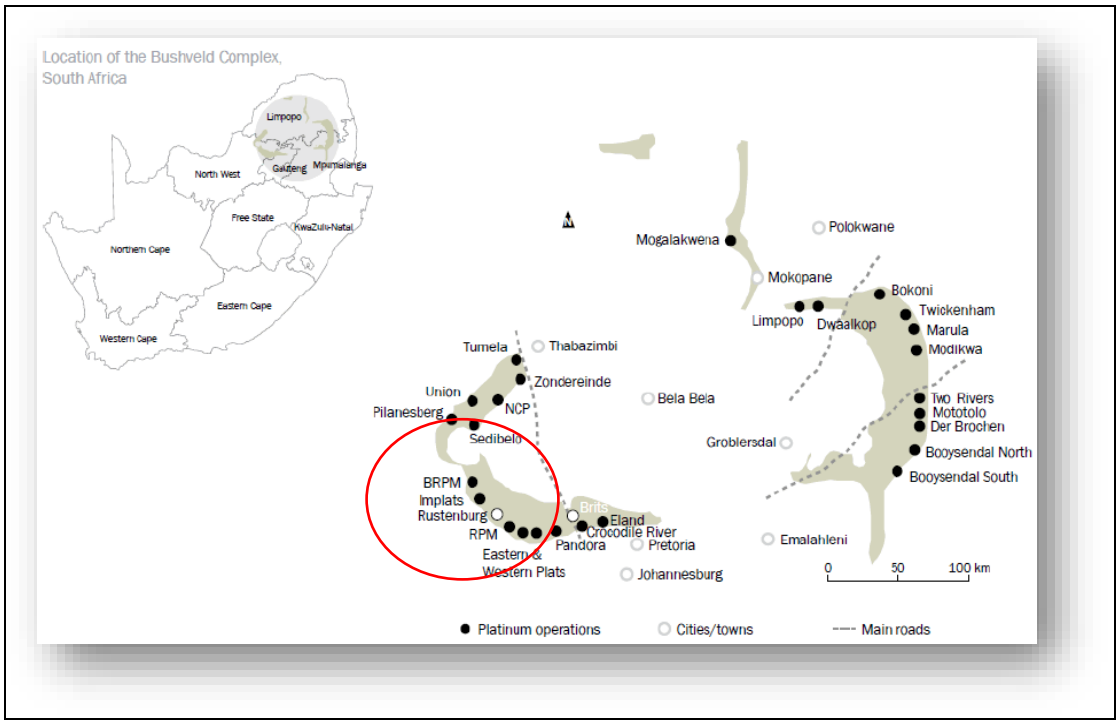

Figure 1.1: Diagram of the three sections of the Platinum Belt in South Africa (MCSA 2021)

Mining operations at Swartklip Farm, located about 90 kilometres north of Rustenburg, were initiated by Rustenburg Platinum Mines Limited in the late 1940s, when the company was the greatest producer of platinum in the world (Oranje et al,. 2021). From the 1960s to the 1980s, mining in the Rustenburg region expanded steadily to meet the rising demand for PGMs used in the

manufacture of jewellery, platinum bars and coins, and catalytic converters (Oranje et al., 2021) Almost 80% of world platinum reserves are in South Africa (Africa Mining IQ, 2023)

According to the Statista (2023), the South African Platinum industry had 63,000 metric tons of reserve in 2022, making the sector most influential in South Africa and the world. This portrays the platinum mining industry as one with considerable potential for growth.

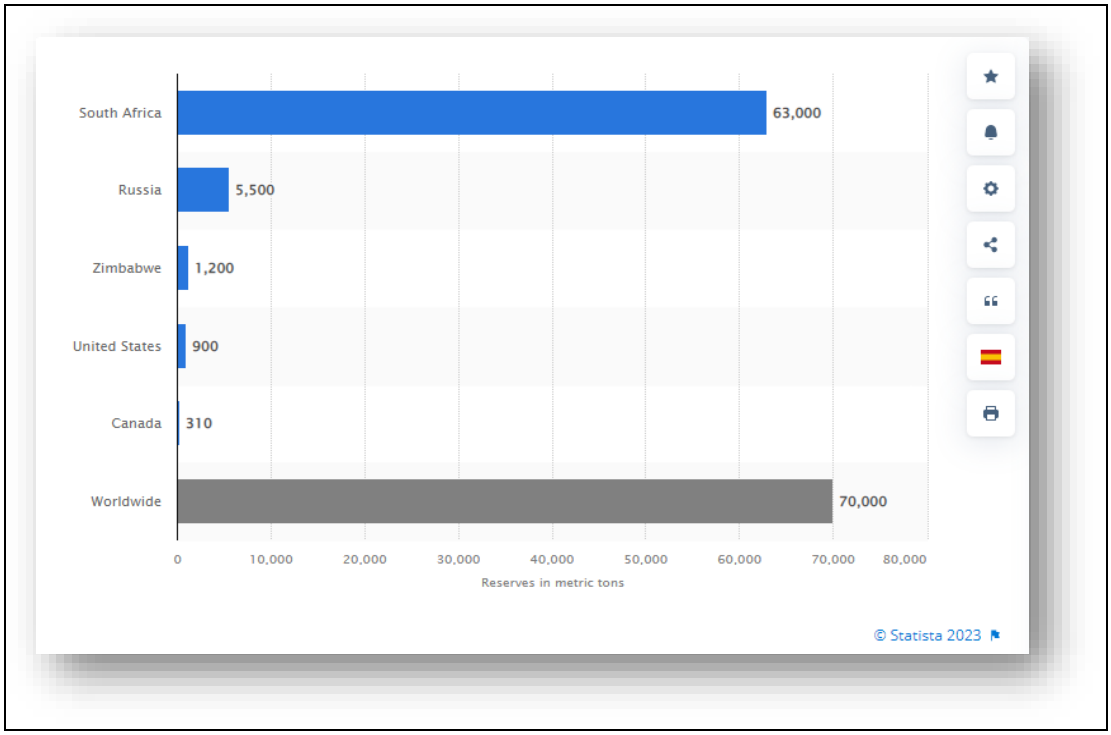

Figure 1.2: Diagram of the world platinum reserves (Statista,2023).

1.2.3 South African Mining Equipment

The South African mining industry is dominated by two types of mining: conventional and mechanised mining industries. Since the discovery of gold in the year 1900, conventional mining methods have been used in the South African mining sector (Antin, 2013). For many years, the mining industry relied on the traditional ways of mining, which required less capital, as mines were

developed, the risk of mining with traditional methods grew, as did the number of fatalities (Antin, 2013).

Due to the high number of fatalities that occurred in the South African mining industry, the South African government as one of the mechanisms of safety in the mining industry passed the legislation that regulated the health and safety of workers in the mining industry (Bakker, 1996). The Act affords employers (Mining operation) new duties and responsibility in the mining industry, requiring them to maintain a safe working environment for their employees (Bakker, 1996). The Act compels the mining operations to appoint Engineers as Appointment 2.13.1 who will be the custodian of the Health and Safety (RSA, 1996).

The mining sector in South Africa adopted mechanised mining processes because of the following advantages: high production volumes, minimal labour requirements, and safety being the main justification of high initial capital cost (Antin, 2013). As a result of these changes in the 1980s, mining equipment had to be designed specifically for use in South African mines. Although other nations had already adopted the mining processes that required mining equipment's due to rising mining labour unrest in the 1970s (Davenport, 2013).

The trackless mining equipment (TMM) is a mining equipment that is used for mechanisation in the mining industry. The vehicle is propelled by an engine and is equipped with tyres. The Mine Health and Safety Act No. 29 of 1996 and its regulations govern mining equipment in South Africa (RSA, 1996). Trackless mining equipment are classified into two types: underground trackless mining machines and surface trackless mining machines.

1.2.4 Mining equipment selection process

Equipment selection for mining operations involves many aspects; production targets, mining methods, and stope dimensions determine the initial mining equipment fleet, an important phase in mining operation planning. Mining

equipment selection process affects mine production, ventilation, maintenance, and project economics (Aykul, et al. 2007).

Due to the unpredictability and difficulty of obtaining accurate data to reach a conclusion, numerous ranges and rules-of-thumb have been created to standardise calculations (Aykul, et al. 2007). Due to inherent variety and complexity in geology, location and company objectives, each design planning process for mining equipment selection is unique. Therefore, mining equipment fleet selection affects productivity, cost, health and safety, and other issues in underground mine design, mobile technology has advanced greatly in the previous century, notably in the last few decades (Marshall et al, 2017). Marshall et al (2017) further argued that, most mines are highly mechanised and using automated mobile equipment to reduce human interaction at the working face in dangerous situations (Marshall et al. 2017).

Mining businesses are under pressure to cut costs and boost productivity. Thus, optimizing mining equipment interaction in materials handling is a complex process with many interrelated components (Durrant-Whyte et al, 2015). Economic conditions, worldwide rivalry, the capital-intensive nature of mining, environmental restrictions, and better health and safety norms require mining operations to use various efficient and innovative approaches to optimize equipment utilization and effectiveness to increase production (Warhurst et al, 1999). Therefore, selecting mining equipment becomes a strategic decision for a company and is carried out by experts in the field and the custodian of Health and Safety on the mine operation (Appointment 2.13.1).

1.2.5 Strategic decisions

Starting from Simon (1993)'s definition of a decision as " a complicated social process that typically takes a long time to complete,". A strategic decision is defined as committing resources and competencies needed to achieve

strategic goals, influence organisational direction and structure, and shape the course of organisation (Maleka, 2014).

Additionally, Maleka (2014) argued that top-level management teams engage in long-term planning in response to novel challenges, complex, or ecological trends., which need either reactivity or proactivity in strategy creation. The research indicates that there are limitation when making the decision and one of the limitation is cognitive bias toward information processing, scientists have called these decision-making process "boundedly rational" (Eisenhard and Zbaracki, 1992). There must be a balance of reason and instinct when making strategic decisions. (Calabretta et al., 2017).

Calabretta et al. (2017) added that, analysis and judgment are aided by the intuitive mind's rapid, unconscious recognition of underlying patterns, structures, and relationships. For this reason, decision-making is a multi-step procedure that has far-reaching consequences for the entire organization and its constituents. First, agents must gather and logically and intuitively interpret all necessary information to make judgments (Citroen, 2011).

Cognitive biases, heuristics, interpersonal dynamics, and demographic or diversity factors can all cloud one's judgement (Eisenhardt, 1999). Decision-makers need effective procedures, particularly in volatile markets, to put their strategies into action. Decision-makers need to cultivate collective intuition in order to recognize environmental trends and problems, encourage conflict and quick resolution, boost strategic thinking, drive the process consistently, and teach productive and timely behaviours (Eisenhardt, 1999).

1.3 The research problem statement

For the South African Mining operations to remain viable in the global competitive environment, it is imperative that mine managers select an optimal mining equipment. Strough et al,. (2011) argues that heuristics and biases

across life span of a decision maker, have influence in their decision-making ability. The cognitive level of a decision maker plays a big role when the decision is made. The researcher in his workplace has an exposure to toil directly with various mining sector where he designs mining equipment which are aimed at improving the safety of employees in the mining sector especially underground operation. The researched identified a gap of biasness conduct by managers during equipment selection.

It is therefore important to investigate the effects of cognitive biases and heuristics during Mining equipment selection. Being bias during equipment selection can lead mine managers to select a sub-standard equipment that can compromise the safety and viability of a mining operation. Aykul et al., (2007) argues that the survival of the mining operation depends on the profitability of the mine and selected mining equipment play an imperative role on the efficiency of the mining operation.

1.4 Theoretical Framework underpinning the study.

Making decisions entails identifying a problem, acquiring information, and weighing viable solutions (Turpin & Marias, 2004). When it comes to making decisions, people from different generation often have different ideas. Judgment norms are established in the first generation based on numerical values and practicality (Turpin et al, 2004; Simon, 1977). This is due to the widespread belief that human beings are inherently logical. However bounded rationality was coined by Simon in 1955, asserts that there are multiple cognitive agents that affect a person's actions, including availability of knowledge, computing capacity, and other external factors, and that these theories eventually moved away from the idea of perfect rationality.

The social/human science and behavioural decision theory on the other hand, recognises the significance of emotions, environment, and cognition in decision-making (Turpin et al., 2004). Decisions are influenced by the

interests, backgrounds, personalities, and experiences of the decision maker; hence this latter viewpoint proposes descriptive models of judgment or qualitative problem-solving and solution-mediation processes (Fineman, 1988). Consequently, this framework will be used in the study to illustrate the effects of cognitive heuristics and bias of decision maker during mining equipment selection.

1.5 The aim of the study

The aim of this study is to investigate the effects of cognitive biases and heuristics of decision makers during mining equipment selection, on the platinum mines in Rustenburg.

1.6 The objectives of the study

The following are the study's objectives:

I. To investigate the presents of heuristics and bias during decision making
II. To investigate if experience in the mining industry lead manages to use heuristics and bias during decision making.
III. To find out what are the most prevalent heuristics and biases during decision making.
IV. To investigate if the decision maker's age and experience can influence the level of biases and heuristics during equipment selection.
V. To investigate if the level of education and cognition will influence the decision maker to rely on the heuristics to fast track the decision.
VI. To find out if the level cognition (Knowledge) lead to heuristics and bias.
VII. To provide recommendations for decision makers and make them aware of the effects of cognitive bias and heuristic during mining equipment selection.

1.7 The rationale of the study

The researcher is of the opinion that mine managers encounter a difficult task in selecting the best mining equipment which suit all the stake holder's interest and needs. The equipment selection process must be objective and overcome

the influence of individual bias and heuristics. How-ever the model of judgment and decision-making biases across the life span of a decision maker, emphasises a deliberative, experiential, and emotive decision-making strategies will influence the decision.

Strough et al (2011) discuss the evidence on correlations between judgment and decision-making heuristics, biases and various abilities and skills (e.g., fluid and rigid cognitive, executive functioning, emotional awareness, character traits). Mine mangers might be using heuristics and biasness (Mind short cut) during mining equipment selection process (Strough et al 2011).

In the preliminary stages of a mining operation, one of the strategic choices that must be made is the acquisition of appropriate mining equipment. Decision-makers may rely on cognitive bias and heuristics to circumvent the effects of their varying levels of cognition, knowledge, time pressure, and emotion during decision-making (Strough et al 2011).

The following literature review will delve deeper into the effects of cognitive heuristics and biasness during decision making.

2 LITERATURE REVIEW

2.1 Introduction

Most established theories of human behaviour hold that individuals naturally gravitate toward the best possible outcomes whenever they make a decision or evaluate a situation. This view is supported by the fact that people are commonly assumed to be rational, near-optimal agents who can efficiently and effectively find solutions to both simple and complex cognitive problems and maximize the benefits they reap from their interactions with the world (Fama and Jensen 1983).

A rational actor would consider the costs and benefits of various courses of action and select the one with the highest net benefit. The key is to factor in everything that can help you solve the issue while leaving out anything that could taint your judgment (Stanovich 1999). The study will build on the work that was done by Simon in 1979 when he coined a bounded rationality of decision making.

2.2. The bounded rationality

The "bounded rationality" of decision-makers has been acknowledged as having cognitive limitations by Simon (1993). This means that people tend to attribute meaning to changes based on their own set of beliefs, perspectives, and preconceptions. Strategic choices, according to Eisenhardt and Zbaracki (1992), are driven by limited rational and political processes. A growing body of experimental knowledge, as cited by Thaler (2017), suggests that individuals' judgments and decisions are often irrational, being influenced by seemingly irrelevant factors or failing to take into account important information. The evidence for this comes primarily from the field of Experimental Psychology, though it is applicable to a wide range of other disciplines as well.

These deviations from the rational norm are also typically systematic, as evidenced by people's tendency to repeatedly fail at the same types of problems by repeating the same mistakes (Thaler, 2017). The researcher concludes that any theory intending to model human judgment and decision-making ought, in principle, to account for such persistent irrationality as well as such cognitive biases and heuristics as confirmation bias and the availability fallacy.

2.3 Definitions of cognition, perception, recognition, cognitive style, heuristics, bias

Many believe using heuristics (also known as mental shortcuts, rules of thumb, or simply "rules") can cause cognitive biases or oversimplify complex problems. Studying the effects of cognitive bias and heuristics requires a clear understanding of the concepts at play which are cognition, perception, recognition and cognitive style before we can delve deeper into heuristics and bias.

2.3.1. Cognition

Cognitive refers to the mental processes and activities associated with the acquisition, storage, retrieval, and use of knowledge and information. These mental processes include perception, memory, attention, reasoning, problem-solving, and decision-making (Choo, 1996). Choo (1996) further elaborated that, cognitive process are the mental activities that allow decision maker to perceive, think, remember, and learn. The ability to perceive and make use of data is crucial to building one's knowledge base, so understanding how the human mind processes information is essential. The essence of knowledge is the conclusion reached after considering available facts and details (Maqsood et al., 2004).

Humans' mental processes in response to their social and physical environments prompted the emergence of the field of cognition psychology. Theorists in the field of social psychology have long recognised that people

don't exist in isolation, but rather within a complex web of interrelated forces, people and environment. (Mitchell et al., 2002).

2.3.2. Perception

Perception of the event, followed using memory to recognize that perception, is the first step in human information processing that enables knowledge construction. The below Figure 2.1 depicts how different sensory inputs (such as sight, sound, and the chemical senses of smell and taste) contribute to how we interpret visual displays (Maqsood et al., 2004).

Maqsood et al (2004) delved in this apparatus of interpreting the data, compiles it, and checks it against its stored records (knowledge). By being put to use and recycled, knowledge is built. Since it is impossible to process all of the data that is being presented to us, perception is a limiting process that only allows for a limited amount of external data to be taken in. Attitudes, values, motivations, stress, and one's background are just some of the variables that can alter one's perspective (Maqsood et al, 2004).

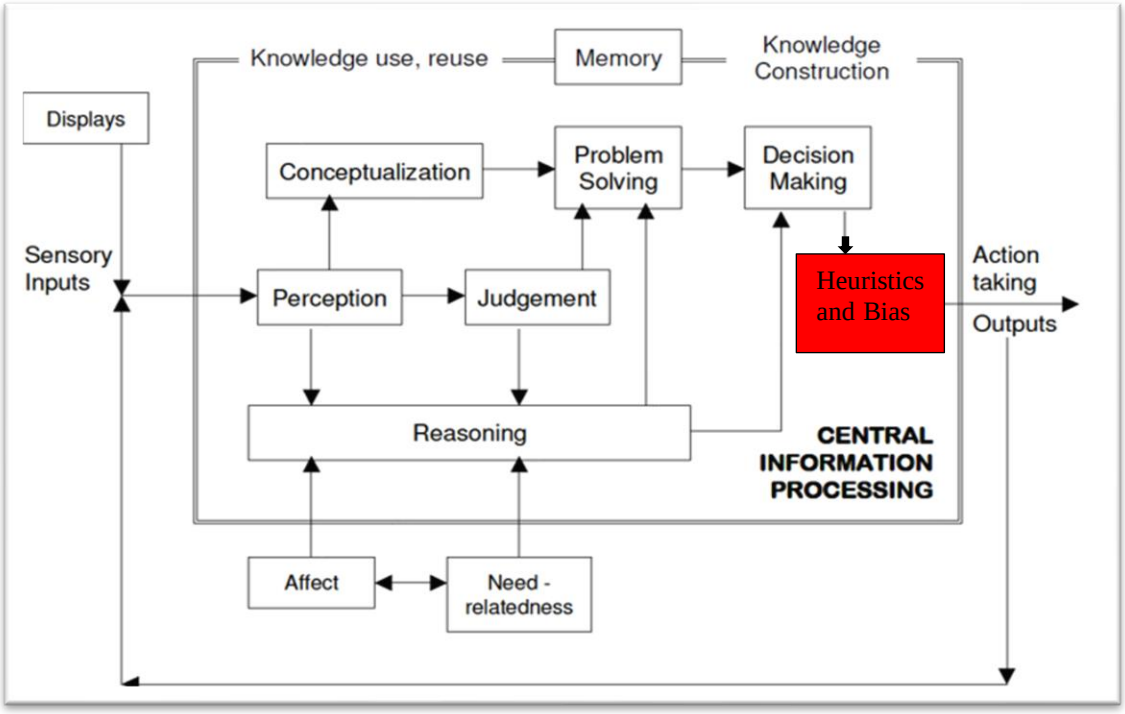

Figure 2.1: Human Information Processing, Adapted from (Maqsood et al, 2004)

2.3.3. Cognitive Styles

Cognitive style is "a person's way of performing perceptual and intellectual activities," as defined by Margunayasa et al, (2019). It is influenced by both genetics and the surrounding environment, which includes things like exposure to and accumulation of knowledge about the world. It is possible to classify managers and thinkers as either systematic, intuitive, receptive, or perceptive. As a result of their varied backgrounds, they approach problems differently due to their unique cognitive styles. Their mental make-up dictates whether they make heuristic, deterministic, or hybrid decisions. Cognitive style can be classified as either high analytical or low analytical (Maqsood et al, 2004)

2.3.4. Heuristics and Biases

(Luan et al., 2019) states that heuristics and biases are the foundation of behavioural decision theory, a theory that accurately describes how people make decisions. To facilitate the goals of this research the details exploration of heuristics and biases will be treated separately.

2.3.4.1. Heuristics

Heuristics are defined as cognitive mechanisms or non-rational decision rules that streamline the decision-making process for a decision maker. These streamlined methods help decision maker seize opportunities by reducing the mental load associated with making tough choices (Arkes, Gigerenzer, & Hertwig, 2016).

2.3.4.2. biases

Biases are understood to be fallacies in judgment. According to Luan et al, (2019) biases are caused by judgemental heuristics that result in less-than-ideal outcomes.

2.4. Exploring Heuristics

The ecological aspect of bounded rationality was largely overlooked after Simon's initial work in favour of the limited cognitive capacities and the heuristics and biases program came to dominate research on judgment and decision making, including managerial decision making (Tversky & Kahneman, 1974).The results of using heuristics are shown to deviate consistently from the rules predicted by logic and statistics (Highhouse et al., 2013).

Most heuristics studied in managerial decision making are inconsistencies or breaches in coherence, similar to the way that economic or logical rationality is often assumed as the benchmark for organisational decision making (Bazerman & Moore, 2008).

Recent research on managerial heuristics has adopted a novel approach. Gigerenzer (2016) mentioned that, both qualitative and quantitative studies demonstrate the efficacy and efficiency of exhausting simple policies to make strategic decisions. Bingham and Haleblian (2012) found that leading companies use a set of heuristics to guide their strategic decision-making, providing them with a competitive advantage. Market volatility is a common occurrence, but research has shown that heuristics are more efficient than knowledge, intellectually demanding approaches (Bingham & Eisenhardt, 2011).

Fast and accurate decision are a household of heuristics for numerical choices that were found to be precise and reliable explanatory models of achievement for strategic choices in a study by Luan and Reb (2017). The study also demonstrated that decision-makers adapted to changes. These studies raise serious doubts about the efficacy of the conventional wisdom that economic rationality and logical thought should serve as the primary guides for business leaders.

Ecological rationality as an alternative approach, where the success of a heuristic or strategy in an uncertain world is used to determine how rational it is (Todd et al., 2012). More and more studies are showing that the decision-making heuristics used by decision makers are at least partially reflective of their personalities (Wright et al., 2000). Managerial heuristics are "thumb-rules" or decision-rules that guide managers as they make decisions, as defined by Crossan et al., (2003).

Managers use heuristics, which are defined by Alvarez and Busenitz (2001) as simplification strategies used when only partial or uncertain information is available, to make strategic decisions, especially in more complex situations. Heuristics are "developing a new idea through a thought process progression," according to by Luan et al., (2019). These authors argue that the success of heuristics depends on the decision maker's ability to learn and gain insight through a process of trial and error. They go on to argue that heuristics are used more frequently than we give them credit for, because decision maker frequently must settle for an approximation of an outcome rather than a certainty.

Farrel et al. (2014), further describe "heuristics" as a "cognitive shortcuts" used by "decision-makers" to speed up and simplify the processing of information. "Decision-making" duties that involve substantial processing of information often lead people to resort to shortcuts, which has long been acknowledged by Political Economy scholars. According to research by Audia et al. (2000), companies frequently re-use strategies that have proven successful in the past. It is common practice for executives to employ strategies that hasten the decision-making process and streamline the integration of strategic and tactical planning (Eisenhardt, 1989).

Goglio (2004) support Eisenhardt (1989) that heuristic processing is generally faster, we might expect decision maker to have faster reaction times to different stimuli. This measure of responsiveness could help the researcher to

learn whether or not decision maker actually favours heuristics over more methodical approaches. If doing so decreases a decision maker's effectiveness and yields suboptimal results, it is not recommended to resort to such shortcuts.

The researcher is of opinion that when the decision maker is estimating the likelihood of an event, it is evident that the decision maker use a number of critical and systematic shortcuts (Heuristics). Luan at al. (2019) state that despite the fact that education level has the potential to correct for such mistakes in judgement, factors other than "rational laziness" lead to divergences from rationality in the realm of choices. Audia et al. (2000) argue decision makers' use of heuristics are guided more by impulse than by intellect, and thus reflect genuine preferences.

Many studies of cognition, including those by Baron (1998) and Busenitz & Barney (1997), operate under the assumption that people are all susceptible to the same types of common errors and tend to make similar heuristic decisions. However, new studies show that entrepreneur are more likely to rely on heuristics than managers in large corporations. According to Luan et al, (2019), managerial cognition is grounded in facts, whereas entrepreneurial cognition is founded on key experience and beliefs.

When we talk about managerial cognition, we're talking about a more methodical approach to decision making in which managers employ strategies like formalized accountability and compensation systems, cross-departmental coordination of business actions, and the justification of future developments with measurable budgets (Alvarez & Busenitz, 2001). Eisenhardt (1989) argues that managers frequently rely on their own heuristics because they lack the time to formally establish policies and procedures.

The managerial mindset is characterized by the use of complex policies, procedures, and mechanisms that ultimately lead to the construction of roadblocks for the pursuit of novel opportunities (Alvarez & Busenitz, 2001).

The researcher is of opinion that such methods of making decisions can help the decision makers to find previously undiscovered openings, learn new skills quickly, and come up with novel, ground-breaking ideas. "The window of opportunity would often be gone by the time all the necessary information became available for more rational decision-making", as Busenitz & Barney (1997) point out. It may be crucial to use biases and heuristics as simplifying mechanisms when confronted with such a wide range of issues.

2.4.1 Major types of Heuristics

Significant progress in the field of managerial cognition was made by Alvarez et al. (2001), they investigated the divergences between managerial decision-making and the emphasis in the mainstream of information processing on generalized (cognitive style) heuristics. Because of this, they were able to introduce the idea that levels of managerial innovativeness are linked to the clustering of individual heuristics, thereby making a significant contribution to the development of decision theory.

By associating various heuristics and heuristic orientations with distinct classes of originality, more than 600 heuristics were uncovered in Manimala preliminary research. Following a series of concatenations and eliminations, he settled on a set of 57 broad categories that he called "major heuristics," each of which contained fewer than 20 heuristics (Manimala, 1999).

The effects of various heuristics on strategic decision-making were summarized by Vallaster (2000), Although she acknowledged that heuristics are an integral part of strategic decision-making, she noted that little is known about how heuristics work, what evidence supports their use, or where we

should be headed in terms of incorporating heuristics into our decision-making processes. Principal heuristics are defined and summarized in Table 2.1.

Vallaster (2000)	
TYPE OF HEURISTIC	**EFFECTS ON STRATEGIC DECISION-MAKING PROCESS**
hindsight heuristic	Similar circumstances from the previous case are found, and the decisions made in those cases are used as a guide.
Simplification	For the sake of simplifying a strategic problem, certain facets of the decision problem are disregarded.
Imitation/Anchoring	It's easy to find and replicate previous decisions that were similar.
Risk aversion	Some types of risk are actively sought by conducting limited trials with links to high-profile failures in the recent past.
Satisfying representativeness	Alternatives are generated only if the initial option is deemed unacceptable by the decision-makers, who are therefore searching for a satisfactory rather than an ideal solution.
Availability heuristic	During decision-making, an individual's natural tendency to recall or imagine frequently occurring events and critical incidents over those that are less frequent.
Cooperation	Everyone involved—including rivals, consumers, and suppliers—shares in the accumulation of new information and the accompanying risk.
Input biases	If information is readily available, easily understood, or highly relevant, it can lead to erroneous judgments on the part of decision-makers.
"Self-serving attribution patterns"	Success is typically attributed to the decision maker's own actions and traits, while failure is typically blamed on circumstances beyond the decision maker's control.

Table 2.1: Cognitive heuristics' primary generic kinds, Adapted from Vallaster (2000)

Table 2.1 lists some of the more common heuristics and biases, but there are many more to be found in the literatures. Gowda (1999) described some examples bias and are the status quo bias, endowment effect, reference point effect, loss aversion, and the zero-risk bias. Some fast and frugal heuristics, as well as their effects and their potential management applications, were

reviewed and discussed by Artinger et al. (2015). Only the following heuristics will be explored in greater depth for the purposes of this study: the **availability heuristic**, the **representative heuristic**, and the **framing heuristic** as they are more prevalent during decision making (Artinger et al., 2015)

2.4.1.1. Availability Heuristic

Available heuristics, as defined by Tversky (1972), is "the bias toward evaluating an event's probability more by its similarity to a population and the process by which it is generated than by the base rate at which it occurs in the population" .Gowda, (1999) explained available heuristics, as when asked to estimate the likelihood of an event, people tend to overestimate its frequency if doing so is facilitated by the ease with which examples of that event can be recalled.

Barnes (1984) argues that the availability heuristic is particularly useful for assessing risk. Limiting open and objective discussion of risk may be the biasing effects of memorability and imaginability (Barnes, 1984). According to Gowda (1999), people's perceptions of the relative risk posed by various potential causes of death are influenced by the availability heuristic.

The researcher is of opinion that, many estimate that accidents cause as many deaths as diseases, despite the fact that the latter kill well over ten times as many people annually. Media portrayals appear to be the basis for people's opinions, and accidents are usually given much more attention than diseases(Gowda 1999).

2.4.1.2. Effects of available Heuristics during decision-making

It's easier to remember and picture common occurrences than it is to recall and imagine fewer common ones. managers may place a greater emphasis on recent information or events than is warranted (Gowda, 1999).

The availability heuristic can cause poor judgment because it relies too heavily on easily accessed memories, which are often insufficient for estimating the likelihood of an event occurring again in the future. Because of this, the final decision will be based on subpar evidence (thedecisionlab,2023).

2.4.1.3. Representativeness Heuristic

As stated by Busenitz and Barney (1997), this heuristic is displayed by decision-makers when they are willing to generalize about a person or phenomenon based on only a small number of characteristics or observations. Busenitz et al., (1997) further mentioned that representative heuristics refer to the tendency of decision-makers to extrapolate from non-random, small samples.

It's common for individuals to generalize about an entire group or a specific subset of that group based on their own experiences or impressions of those individuals. A person's impression of a group may be skewed by their interactions with a few outliers from the group (Gowda, 1999).

2.4.1.4. Effects of Representativeness Heuristics during decision-making

Katz (1992) argues that decision makers frequently take convenient routes when making decisions due to their reliance on representativeness and their willingness to generalize from small, non-random samples. Large random samples that could accurately predict phenomenon, customer, demand,

production costs, and other crucial factors are rarely available (Busenitz & Barney 1997). In such a situation, decision maker may feel compelled to base their decisions on disproportionately small samples (Busenitz & Barney 1997).

2.4.1.5. A Framing Heuristic

The term "framing" is used to describe a type of judgmental heuristic in which people's responses to the same choice problem are systematically different depending on how the problem is framed (Le Roux et al., 2006). The way information is presented can have a significant impact on the audience's reaction. Preferences can be changed with the right framing of information. According to Le Roux et al. (2006), decision maker may simply categorise and then frame the same stimuli differently than the other decision maker, based on the tenets of cognitive theory.

Maree et al. (2003) agrees with Alvaraz et al. (2001) agrees that here is evidence to suggest that a person's thinking preferences, as measured by the Herrmann Brain Dominance Instrument, can have a significant impact on their decision-making ability, even in highly uncertain and complex situations. Different people's perspectives on the same situation are supported by the fact that we all tend to be guided by favouring some information over others when trying to understand the world (Le Roux et al., 2006).

2.4.1.6. Effects of Framing Heuristics during decision-making

The question of whether people can be taught to alter their perceptions of external factors to their advantage when making a business decision to launch then arises (Le Roux et al., 2006). As a result of the framing heuristics, we end up making different choices depending on how the information is framed. Similar data can be presented in a variety of appealing ways, depending on the details that are emphasised.

In summary, Heuristics are useful tools and can be thought of as the mental evasion used by decision-makers to streamline the managing of data (Knowledge). An overwhelming majority of the time, heuristics are used unconsciously to streamline judgment. This stress-relieving strategy could cause less-than-ideal choices. According to Tversky and Kahneman (1974), mangers are more likely to rely on illative heuristics, "rules of thumb," when making decisions than on statistical principles.

A heuristic, then, is a mental short cut used to get around informational constraints. Heuristics are required even when there is insufficient data to make well-informed decisions because of the considerable ambiguity and uncertainty decision makers often face.

2.5 Exploring bias.

There are a variety of literary definitions for the term "bias," but generally speaking, it refers to an irrational belief that can cloud one's ability to make an objective judgment (Schwenk, 1986). Cognitive biases have been argued to be useful in facilitating the adoption of optimal behaviours within limited contexts (Gigerenzer, 2016).

The term "cognitive bias" refers to "situations in which human thought consistently yields results that are systematically at odds with some facet of neutral certainty" (Luan et al., 2019). The authors, argue that "cognitive biases are a pervasive element of strategic decision-making". These researchers identified four primary types of cognitive biases: overconfidence in one's own knowledge; overconfidence in one's ability to handle uncertainty; insensitivity to outcome probabilities; and the illusion of manageability. Cognitive biases have been widely acknowledged in the literature as critical components of strategic planning and decision-making (Luan et al., 2019).

For the purpose of gauging cognitive biases and its effects various measures of performance, such as logical completeness, precision, and throughput speed, can be isolated (Haselton et al., 2015). However, the importance of this cannot be overstated, as cognitive biases are viewed as "indicators that can be used to identify opportunities for process improvement" (Barber a-Marine et al., 2019). Strategic decision-making in this setting can be predicted to be impacted by factors like the illusion of control (Keh et al., 2002).

Some people, according to Simon et al. (2000), are unable to conduct thorough searches for or correctly interpret information due to their limited cognitive capacity. Cognitive heuristics and simplifying tactics are used to go past these limitations, but they can lead to a wide range of biases. Due to these biases, managers may fail to properly examine the repercussions of their decisions, putting the company at risk (Simon et al, 2000). Simon & Houghton, (2002) added that some of the cognitive biases that can cloud manager's judgment are " believing in small numbers, the planning fallacy, overconfidence, illusion of control, counterfactual reasoning, affect infusion, and self-justification".

Because of the urgency with which they must act to seize brief windows of opportunity, decision makers are particularly vulnerable to the biases highlighted above (Baron, 1998). Simon et al. (2000) analysed how the cognitive biases of overconfidence, belief in the law of small numbers, and illusion of control influenced the risk perception and decision making of business leaders.

The researcher is of opinion that biases help mangers to deal with their cognitive limitations in uncertain situations, but because they violate the laws of probability, they can lead to less rational, less comprehensive decision-making. Since the decision-making environment of managers is often particularly uncertain and complex, researchers who study cognitive biases hypothesise that managers themselves may display greater bias.

Management's optimistic views of a possible action in these cases are influenced by cognitive biases (Simon & Houghton, 2002).

Even though there are many types of biases, this investigation will focus on four of them: overconfidence, belief in small numbers, the illusion of control, and the planning fallacy. The likelihood of decision maker to take action under uncertainty is affected by all four of these biases (Simon & Houghton, 2002).

2.5.1. Precise biases

2.5.1.1 Overconfidence bias

Overconfidence, as defined by Zacharakis and Shepherd (2001), is "the tendency to act with excessive assurance in the face of ambiguous evidence, despite the existence of important caveats" Overconfidence, was first described by Oskamp (1995), is a common occurrence in the decision-making process, as evidenced by numerous studies (Russo & Schoemaker, 1992).

Decision makers become overconfident if they are excessively confident in their first evaluation opportunity and if they are sluggish to update that assessment considering new information, as stated by Busenitz & Barney (1997). Because people often fail to adequately revise their initial estimates after learning new information, they may fail to recognize the extent to which their estimates were incorrect and thus suffer from overconfidence (Marshall et al., 2013).

Often managers place a high value on their ability to quickly recall reasons for confidence, and this becomes the basis for their assurance (Simon et al, 2000). Overconfident decision maker may fail to recognize the inherent uncertainty in the conclusions that they draw from their assumptions (Simon et al, 2000). The decision makers' tendency to be overconfident in their assumptions of fact has been linked to a lowered perception of risk.

If the decision-maker waits until all the "facts" are in before starting to convince others that the decision is founded on facts, the opportunity that they are seeking to capitalize on will likely be gone by the time the whole data set has become available (Busenitz & Barney, 1997).

2.5.1.2. Effects of overconfidence bias during decision-making

When deciding with little structure, like whether to launch a new product, this bias is common. In this case, the decision maker's ability to recall the foundations of their confidence with such absoluteness increases the risk of them succumbing to overconfidence (i.e., availability heuristic).

As a result of their initial overconfidence, they are not open to changing their minds considering new information and instead look for evidence that supports rather than contradicts their preconceived notions (Keh et al., 2002).

An overconfident decision maker will look for positive reinforcement of their product launch or business decision rather than checking out any potential drawbacks.

2.5.1.3 The bias caused by the "law of small numbers".

When a decision maker uses a small sample of data to draw broad conclusions about a much broader population, they are demonstrating their faith in the law of small numbers (Tvensky & Kahneman, 1974). The representative heuristic causes people to wrongly assume that tiny samples are very comparable to the population from the area they were chosen, even when there are reasons to suggest that this is not the case.

The researcher believe that small samples are unpredictable and have low predictive validity, so they can't be relied upon to accurately represent a large

population. Decision maker who place too much stock in the law of small numbers may be overconfident in their judgments (Zacharakis and Shepherd 2001). This prevents them from comparing their project's success to the rates typically associated with similar projects for which more data may be available (Simon et al., 2002).

The researcher is of opinion that when the decision maker rely on their own networks to gather data, they may come to believe that their sample size is large enough to yield reliable and detailed insights into a topic (a fallacy known as the "law of small numbers"). Decision makers in this category are more likely to remember and value facts learned in a one-on-one setting(Simon et al., 2002)

Overconfidence in the decision success is more likely to result from a combination of a strong faith in the law of small numbers and mostly positive information (Simon et al, 2000). In any case, as Busenitz & Barney (1997) point out, that organisation typically don't budget for a means to conduct extensive, systematic data collection and research unless if the risk is High (Keh et al, 2002).

The research shows that business failures are less likely to be widely publicised. Decision-makers, according to Simon et al. (2000), tend to get an unrealistically high amount of flattering information. Overconfidence in the decision and a reduced sense of risk are likely results of a strong belief in the law of small numbers in conjunction with unduly more positive information, which can lead to the decision to begin (Keh et al, 2002).

2.5.1.4. Effects of law of small number bias during decision-making

The bias is at amusement when a decision maker conceptualises a new idea after confirming it from a small number of potential supporters that they are interested in the concept. (Simon and Houghton, 2002)" then argued that the

opinions of few individuals are not indicative of the population or organisation". They further alluded that the result might be business owners ignore important statistics pertaining to endeavours like theirs. It's also possible to disregard the results of market studies conducted to ascertain the true demand in the market (Simon & Houghton, 2002).

The researcher is of the opinion that A decision maker who bases his or her decision to implement an idea on the opinions of a small group is succumbing to the law of small numbers bias.

2.5.1.5 Bias caused by Illusion/false sense of control.

An illusion of control bias transpires when a person incorrectly evaluates the relative importance of their own abilities and those of chance in producing a desired outcome (Le roux et al, 2006). Simon et al 2002 supported that managers who exhibit this bias, incorrectly assume they will achieve more success, than they will because they have an inflated opinion of their own abilities.

According to Keh et al. (2002), those who suffer from an illusion of control bias tend to undervalue the risk associated with a decision because they believe they can steer clear of unfavourable outcomes by making better use of their skills. Managers/decision makers try to calm their nerves by telling themselves they can control and properly forecast the results of unpredictable future occurrences, an idea that is supported by Simon et al. (2000).

The researchers agree that when the decision maker overestimate his/her control over a situation, he/she is less likely to plan ahead for potential obstacles and more likely to choose for the most direct route to success. It can also make decision maker to cling to superstition and wishful thinking when he/she know that neither will help us.

2.5.1.6. Effects of false sense of control bias during decision-making

When the decision maker is presented with a potential opportunity, he/she will look at the opportunity more favourable than anyone else, if he/she has faith in his/her own abilities, he/she might think he/she can single-handedly or make the business succeed. According to research by Keh et al., (2002), decision makers/entrepreneurs place a high value on influencing the results of their decision, this is because they view themselves as able to influence the actions of others and the course of events.

Khen et al. (2002) adds that, the decision maker's confidence in his own abilities, bolstered by the illusion of control bias, will increase his willingness to take on the inherent risk of the decision. The researcher is of opinion that, decision maker who exhibit illusion of control bias will decide to implement the plan on the assumption that he is the primary factor in its eventual success, even though he is unaware of any external factors that might affect the outcome.

2.5.1.7. Bias due to the Planning Fallacy

Overconfidently anticipating the likelihood of success while underestimating the risks is what Baron (1998) calls the "planning error." He further mentioned that, planning fallacy bias occurs when the decision maker fails to learn from past experiences and decides without fully appreciating the inherent risk of the decision. Baron 1998 further adds that decision makers who shows planning fallacy bias tend to make predictions about the future based not on experience or knowledge, but on their hopes and dreams for the future, these projections could be too optimistic.

The researcher believes that planning fallacy has a greater impact on decision makers, because they will evaluate risks as being lower in orders to support

their decision. The planning fallacy is a "cognitive blind spot," as described by Kahenman and Lovallo (1993). Due to these tendencies, it is possible that various tasks will be scheduled in an unrealistic amount of time (Baron, 1998).

2.5.1.8. Effects of planning fallacy bias during decision-making

Goh, (2000) shows that manager could choose to forget about his previous setbacks, rather than reflect on his past failures to learn from them, he may jump headfirst into a new endeavour without giving any thought to how he can avoid making the same mistakes twice.

Decision-makers, according to Baron (1998), tend to give themselves a rosy vision of the future by treating the present circumstance or choice as novel and untethered to the lessons of the past.

2.6 Conclusion

Luan et al. (2019) conclude that decision makers who use biases and heuristics to implement decisions may profit. The researcher concludes that incorrect assumptions must be changed to reflect environmental and market reality. According to study, such modifications can be taught.

Reassessing biases and heuristics usually involve cognitive learning. Kim (1993) states that cognitive learning happens when the mental map shifts and no longer views a problem or opportunity as "biased."

Drucker (1994) suggests that a decision maker's "image or theory" of the firm must be changed to survive, replacing old assumptions with fresh knowledge. For this, decision makers must encourage collaboration, innovation, flexibility, and change (Lichtenstein, 2003).

The researcher found that decision maker cognition helps explain why entrepreneurs/managers do what they do. Cognitive biases reduce risk, making managers more likely to implement the new option.

According to Gaglio (2004), it has become abundantly evident that human thinking is frequently heavily influenced by a wide range of errors and biases—"cognitive tilts" that can result in incorrect decisions, erroneous inferences, and unreasonable expectations.. According to the literature, all humans employ heuristics and biases while making decisions, even managers.

3 RESEARCH STRATEGY, DESIGN, PROCEDURE AND METHODS

3.1. Introduction

This section elaborates on the conceptual framework and methodological procedures that formed the basis of the study. In this section, the researcher also discusses the study's methodology. Methods and analyses used to collect data for this study, are elaborated upon below. The study's methodology, inclusion/exclusion criteria, and data collection, study sample are discussed after this introductory section.

The methods and tools for data analysis follow, after data collection and collection tools have been discussed. Following these are some final deliberations on the section's themes as well as some consideration of ethical implications. This research is exploratory study. According to the definition provided by de Vos, Strydom, Fouche, and Delport (2011), the goal of an exploratory study is to learn more about a certain phenomenon about a group, or individual. Evaluation of the effects of cognitive bias and heuristics of mine Management during the mining equipment section is the phenomenon under investigation in this research.

This section describes the data collection and analysis procedures that were integral to the research design, which informed the study. After this, there is an in-depth discussion of the research strategy employed, followed by an account of the study site and its accessibility. The section then details the process used to choose the participants. Data gathering and analysis are discussed next, followed by some thoughts on reflexivity and ethical concerns.

3.2. Research Design

The research used a qualitative method and an exploratory design to investigate the prevalence and impact of cognitive bias and heuristics in the mining industry during equipment selection. Using a qualitative method, de

Vos et al, (2011) explain the significance of the participants' experiences, interpretations, and perspectives. Creswell (2007) argues that one of the benefits of qualitative research is that it allows researchers to collect participants' personal opinions on the premise that reality is incorporated in people's experiences.

This method is proper for this research because the researcher want to understand the actual thought process of managers as they choose equipment for the Mine. Therefore, it is crucial during the equipment selection process to comprehend the mine managers' subjective interpretations, cognitive biases, and heuristics (de Vos et al., 2011). Interviews were conducted using a phenomenological methodology. Based on the premise that the participants are, in fact, human beings, this method places a premium on getting to know the participants and building trust before proceeding with the study (Smith, 2004).

Building trust allows everyone involved to feel comfortable sharing their stories in their own words and provides a solid foundation for further discussion (Bryman, 2016). Furthermore, the anti-oppressive stance taken by this approach makes it a secure environment in which people feel comfortable sharing their experiences. The researcher transcribed the audio recording of the interview conversation.

3.3. Study Population

The study participants were selected from different mines that are operating in Rustenburg area. It was assumed that the Shaft Managers, Engineering managers and Procurement Managers are the key stake holders for mining equipment selection as they hold legal appointment 2.13.1 and are responsible for safety of the employees of the mine (Antin, 2013).

Northwest Province, South Africa is home to Rustenburg, which is where the world's largest platinum reserves can be found (Africamining IQ, 2023). Rustenburg is home to 35 of South Africa's Platinum Group metals mines, from the 35-platinum mining operation as per figure 1.1, only 20 mining operations are fully mechanised mines (Mining IQ's database, 2023).

3.4. Sampling Strategy

The sample is "composed of typical attributes of the population that serve the purpose of the study," so this method of selecting participants is known as "purposive sampling," as defined by Marshall (1996). Purposive sampling, as proposed by Creswell (2007), enriches the study of the phenomenon at hand, in this case, the presents and effects of cognitive bias/heuristics during mining equipment selection.

After interviewing one of the key account managers at a Mining Equipment supplier, the researcher was able to compile a list of Mining customers in Rustenburg from which to draw participants. Since the researcher does not reside in Rustenburg, he introduced and invited around thirty-eight participants to the study using e-mails, WhatsApp, and phone calls. However, only eight participants expressed interest in the study and responded to the invitation, to take part. Participants were selected based on their willingness to take part in the study and they occupy a legally appointed 2.13.1 in the mining industry.

3.4.1. Inclusion criteria

Therefore, the study participants in this research are: (inclusion criteria):

- The shaft engineers, procurement managers and Engineering Management from Rustenburg platinum mine.
- Legally appointed as 2.13.1 in a mining operation.
- The shaft engineer and procurement manager who are working in a mechanised mining shaft.

3.4.2. Exclusion criteria

The exclusion Criteria:

- Anyone who was not employed as a mine worker.
- Anyone who was not in a strategic position.
- Anyone who works at a conventional mine.
- Anyone who was not legally appointed as 2.13.1 Personal.

The study's mixed-gender sample allowed the researcher to investigate how bias and heuristics play out differently for men and women. A detailed participant information sheet was sent to those who showed interest in the study (Bryman, 2016). The researcher managed to find eight participants from five Mechanised mining operation in Rustenburg who are legally appointed as 2.13.1 official. A total of eight people were enlisted to take part, with seven men and one woman. Notwithstanding the difficulty in recruiting participants, the interviews were fruitful, and the required information was collected.

3.5. Data Collection Methods and Tools

The inclusion of open-ended questions was motivated by the expectation that respondents would provide detailed accounts of their experiences while selecting mining equipment. The advantage of open-ended interview questions is that it allows the participants to speak freely without any limitations. They can ventilate and give their insight about a particular phenomenon.

The researcher travelled to Rustenburg to conduct the interviews at the convenience of the participants, five interviews were conducted face to face in Rustenburg. Three interviews were conducted using Microsoft teams for the convenient of the participance and the participants later forwarded the interview responds through e-mail. All of the interviewees selected English as their primary language of communication, thus the interviews were done in that language using a simple interview guide. Each session lasted between 45

and 60 minutes, and audio tapes were made so that the researcher could obtained additional information.

During the Microsoft team meeting, the researcher took notes in a notebook and utilized questioner paper to record the nuances of the conversation that went beyond words. Bryman (2016) added that keeping notes facilitates member checking, which verifies the veracity of the participants' responses. Each person who was interviewed for this study gave consent to be interviewed and recorded beforehand. The interview question guide served as a basis for the questions asked and the order in which they were asked (de Vos et al. 2011).

The researcher was better able to question and investigate the discussion's most salient points (Morgan, 1997), Included in the questions asked were: Do you have a mining equipment selection process? Is mining equipment selection process a strategic decision in your organisation? Are you a consultative person during decision making? The other questions were to evaluate the presence of heuristics and biasness during mining equipment selection.

3.6. Data Analysis

After that, the researcher underlined passages that meant the same, discussed the same, or were on the same issue (Braun & Clarke, 2006). After that, a thematic analysis of the collected qualitative data was conducted. "familiarising oneself with data," "creating prior codes," "looking for themes among codes," "reviewing themes," and "identifying themes" are the six processes of thematic data analysis.

3.7. Rigour and Trustworthiness

Purposively selecting participants who provided detailed information on their mining equipment selection experiences assured qualitative data trustworthiness and rigour. The researcher interviewed equipment selectors. The researcher employed open-ended interviews and questionnaires without leading participants. It was made clear to participants at the outset of the interviews that their participation was entirely optional and that they might withdraw from the study at any moment if they so desired. This ensured that only honest persons participated.

3.8. Reflexivity

Researchers who engage in reflective practice are better able to analyse their data objectively and effectively (Watt, 2007). In this step, the researcher recognises any biases or prejudices that might influence the results of the study (Hennink et al., 2011). As humans, we come equipped with preconceived notions and opinions, shaped by our past experiences and the information we have absorbed (Shenton, 2004).

The way we act and think, the values we hold, the faith we profess, the age we are, the culture we were raised in, and the social position we occupy all contribute to our worldview (Watt, 2007). When the study first began in 2022, the researcher did some introspection.

The researcher had a personal experience towards the biasness as a Project Engineer. The researcher was tasked to introduce a new fleet of mining equipment in one of South African mining operation. The experience and exposure to biasness had a significant impact as the researcher had an in-depth observation as to how biasness occur in workplaces.

After the exposure and the knowledge acquired regarding mining operations and other related industry decision-makers. The researcher began to wonder

if the mining personnel who are tasked to select the mining equipment if they adhere to all the procuments processes and not biased towards other equipment suppliers.

3.9. Ethical Considerations

All participants signed an informed consent form that had been pre-drafted (Hakim, 2000). Participants were given a copy of the consent form to read over and sign if they wished to take part in the study.

The language used for consent form and the purpose of the study was in English. The documents detailed the study's goals, the time engagement required, and the potential benefits and risks of participating in the study. Participants were also informed that they would not be compensated in any way for their time or effort (Bryman, 2016). The participant's participation was entirely voluntary, and they were under no obligation to continue should they had wished to disengage from the study (Babbie, 2007). Participant privacy was protected by not allowing anyone else access to their individual responses (Babbie, 2007). The researcher used a password to restrict access to the laptop and recording device, where all the study data was stored.

Participants confidentiality was protected in a form of using pseudonym. In order to protect the identities of those responding, anonymity must be preserved (Babbie, 2007). That is why maintaining participant anonymity was essential. Participants were given aliases to protect their anonymity and the confidentiality of their responses.

The term "voluntary participation" refers to the fact that people taking part in a study are doing so of their own free will. The researcher was able to connect with the participants through the key account manager of the Rustenburg mines. Participants were reminded that their participation was completely optional and that they were free to stop participating in the study at any time (Babbie, 2007).

4 PRESENTATION OF RESEARCH RESULT AND DISCUSSION

4.1. Introduction

There are three main parts devoted to the presentation of the study's findings and discussion, followed by a brief summary. An overview of the demographics of those who participated in the study makes up the first part of this section and followed by thematic presentation of the results. The thematic presentation of the result will evaluate the present of cognitive bias and heuristics and their effects while decision makers select mining equipment. First, we present the results of demographics analysis of surveyed participants and the trends among mining industry decision-makers.

4.2. Participance demographics Questionnaire Results

Overall, thirty-eight participants were asked to be part of the study and fill out the survey questionnaire. Of those who responded, only eight (N=8) were considered usable for the study. The other respondents were asked to take part in the study but declined, as well as those in which respondents started filling out the questionnaire but stopped before finishing it, were deemed unusable. The researcher interviewed more participance than was originally planned so that we could meet the methodology's minimum sample size of eight. Thus, 35% of responses were usable.

4.2.2. Demographic profile of respondents

There is a strong correlation between the research personnel characteristics of respondents and the quality of their responses to the research questions. The responses were presented alongside demographic data such as age, years of experience, gender, race, and educational level.

4.2.2.1. Demographic profile of respondents

Demographic profile of respondence								
Name(Pseudo-names)	R1	R2	R3	R4	R5	R6	R7	R8
Gender	Male	Male	Male	Female	Male	Male	Male	Male
Race	Black	White	Black	Black	Black	Idian	White	idian
Educational Qalification	Degree	Degree	Masters	Degree	Degree	Degree	National diploma	Degree
Age category	26-30	26-30	41-45	36-40	56-60	36-40	56-60	26-30
Yeas of Experiace Catergory	5 years under	11-15 years	16-20 years	11-15 years	16-20 year	16-20 years	26 Years above	5 years under

Table 4-1: Demographics profile of Respondents

The results indicates that males make up most respondents, it also raised a question regarding gender dominance in the mining industry. As the industry is known to be male dominant. The respondents were mainly males, totalling 87.5% men, the remaining 12.5% were female respondent.

Table 4.1 shows that, Black Africans constituted more than half of the respondents (50%), followed by White (25.0%) and Indian (25%). Studies shows that mining school still enrol high number of students despite the industry's relatively low standards for education and training (Davenport, 2015). According to the results in this study, 75% of the participants obtained a university degree and 12.5% Obtained a master's degree and 12.5% obtained a diploma.

The respondents age skew heavily to age 26-30 by 37.5% and the notable part was that there was only 12.5 % of 41-45. The researcher is of the view that between the ages of 41-50 mostly are in the Executive group which are the decision makers. The study further indicated that 25% of participants were age 56 to 60. The respondents' years of experience was heavily skewed to 16 to 20 years of experience which is 50% of the participants. The result also shows that there is 25 % of the participants who are less than 5 years of experience. The researcher is of a view that the mining management are addressing the mining skill shortage by bringing the young generation in to management level.

4.4 Thematic analysis

Data collected from the participance during the interview was arranged into five deductive themes as per table 4.3. The preconceived themes emerged from the literature reviewed and the relate to the effects of cognitive biases and heuristics during equipment selection. The theoretical framework of the study five a strong deductive theme (Caulfield, 2022). The analysis of data will follow a semantic approach.

Main Themes	Sub-Theme
1. Selection process	1. Exposure level 2. Experience
2. Selection process as a Strategic decision	1. Organisational strategy communication. 2. Resource commitment and capability
3. Frequencies of heuristics and biasness	1. Level of education 2. Organisational process
4. Correlation between heuristics and level of education	
5. Correlation between heuristics and years of experience	

Table 4.2 Main theme and sub-themes

4.4.1. Selection process

The research indicates that equipment selection process is not clear in the mining industry as each mine is different (Marshall et al., 2017). The participant also indicated that the process is not or not available. The most notable point on the study is that the more experienced participants agreed that there should be a clear mining equipment selection process**.** How-ever the literature show that there is no standard set of criteria that is common among the mining operations (Marshall et al., 2017)

Aykul et al. (2007) mentioned that were mining equipment selection process is not clear a rule-of-thumb is used. These rules can only be acquired by experienced mine workers.

4.4.2 Selection process as a strategic decision

Bukszar, (2009) define strategic decision as committing resources and competencies needed to achieve the strategic goals and influence organizational direction. Majority of the participants agree that equipment selection must be part of the strategic decision, some participants mentioned that it will align the organizational structure in a way that they develop a standard process to select equipment and components.

In addition, the other participants mentioned that the selected equipment has to be supported or maintained, and equipment maintenance is a co-function of the mining operation and standard components across the equipment make maintenance easy. Other participants mentioned that for equipment selection process to be a strategic decision it will require resources and as an organisation manpower resources becomes a challenge.

As mentioned by Aykul et al., 2007 that as it becomes unpredictable and difficult to obtain data during the equipment selection process it means the decision maker will be under bounded rationality when makes the decision. As the literature illustrated, those heuristics will come to play as a "simplifying strategies" because managers use heuristics and bias when making decisions, especially in complex and uncertain situations (Busenitz & Barney, 1997)

4.2.3 Presents and Frequencies of heuristics and biasness.

The research questions were written so that the researcher could determine the presence and impact of bias and heuristics in the selection process for mining equipment. Most respondents demonstrate some form of heuristic/bias

and its effects, as shown in Table 4.7. However, it is important to note that 87.5% of participants did not exhibit the presence and effects of framing heuristics. This research demonstrates that the adverse effects of heuristics can be mitigated by increasing the level of education one possesses (Luan et al., 2019).

This research on framing heuristics demonstrates that these shortcuts in reasoning can be used intuitively and with a low cognitive load. Another overarching principle is that people with more education tend to dig deeper into a topic and form their own opinions rather than accepting the word of others.

In addition, the most important results concern the heuristics that are currently available. Nearly seven in eight respondents (87.5%) demonstrate the validity and utility of these heuristics. One can assume that decision-makers will always resort to the most convenient option. According to the results of the study, managers will stick to the tried-and-true methods with which they are already familiar (Tversky,1972). Because the research shows that managers/decision makers may place a greater emphasis on recent information, this finding can also aid the equipment supplier that if you Brand becomes a common picture, and easier to remember (Gowda, 1999).

False senses of control bias is another unexpected finding. According to the study by Khen et al. (2002), the present and effect of this bias is most evident when the respondent exhibits greater confidence in his abilities or experience than is warranted. Most respondents who displayed this behavior did so because they were trying to make the best of a bad situation after the decision maker made a mistake. Another possible implication is that some decision-makers will opt to take the risk associated with the decision and subject it to the method of trial and error.

Cognitive bias and Heuristics			Frequency	Percent	Valid Percent	Cumulative Percent
Available heuristics	Valid	YES	7	87,5	87,5	87,5
		NO	1	12,5	12,5	100,0
		Total	8	100,0	100,0	
Representative Heuristics	Valid	YES	5	62,5	62,5	62,5
		NO	3	37,5	37,5	100,0
		Total	8	100,0	100,0	
Framing	Valid	YES	1	12,5	12,5	12,5
		NO	7	87,5	87,5	100,0
		Total	8	100,0	100,0	
Small number bias	Valid	YES	5	62,5	62,5	62,5
		NO	3	37,5	37,5	100,0
		Total	8	100,0	100,0	
false sense of control bias	Valid	YES	6	75,0	75,0	75,0
		NO	2	25,0	25,0	100,0
		Total	8	100,0	100,0	
Planning fallacy	Valid	YES	5	62,5	62,5	62,5
		NO	3	37,5	37,5	100,0
		Total	8	100,0	100,0	
Sens of control	Valid	YES	5	62,5	62,5	62,5
		NO	3	37,5	37,5	100,0
		Total	8	100,0	100,0	

Table 4-3: Frequency table of cognitive bias and Heuristic

4.2.4 Correlation between heuristic biasness and level of education

In a bivariate correlation analysis between the measures of biases/heuristics and education level, it is notable that there is no correlation between education level and the following: a small number bias, planning fallacy, framing heuristics, and representative heuristics. The study also demonstrates a 0.756 correlation between level of education and available heuristics.

Sense control bias (0.516) and false control bias (0.577) are two other significant correlations. The coefficient of correlation is a numeric value between +1 and -1 that quantifies the degree of association between two variables. A negative correlation value is one that is less than zero. If the

coefficient of a correlation is one, it means that any change in one variable reliably predicts a change in the other variable in the same direction. A correlation coefficient of zero indicates that there is no relationship between the two variables (Investopedia 2023)

Correlations						
		Statistic				
Variable	Variable	Correlation	Count	Lower C.I.	Upper C.I.	Notes
Qualification/Education level	Sens of control	,516	8	-,296	,895	
	false sense of control bias	,577	8	-,215	,911	
	Small number bias	,000	8	-,705	,705	
	Planning fallacy	,000	8	-,705	,705	
	Framing	,000	8	-,705	,705	
	Representative Heuristics	,000	8	-,705	,705	
	Available heuristics	,756	8	,110	,953	
Missing value handling: PAIRWISE, EXCLUDE. C.I. Level: 95.0						

Table 4-4: Correlation between bias/Heuristic and Level of Education

4.2.4.1 Hypothesis 1

The researcher hypothesis that the level of education and cognition will influence the decision maker to rely on the heuristics to fast track the decision.

The research demonstrates a link between specific heuristics and biases; however, it is clear that decision makers with a high level of education make greater use of the available heuristics than those with a lower level of education.

One other factor that correlates with both sense of control bias and false sense of control bias is the level of confidence that decision makers have in their own abilities to make the right choices (Khen et al., 2002).In particular, the relationships between education, cognitive ability, and the use of certain heuristics are proved by the study of Luan et al., (2019) which

demonstrates that people of varying educational backgrounds can mitigate the negative effects of heuristics and make more accurate decisions when using them.

4.2.5 Correlation between heuristic, biasness and Years of experience in the mining industry

Bivariate correlations between mining industry experience, heuristics, and bias are displayed in Table 4.9. Notably, all heuristics and biases are negatively correlated with one's level of experience. A negative correlation value is one that is less than zero. The coefficient of a perfect negative correlation is -1, indicating that an increase in one variable predicts a decrease in the other with a high degree of accuracy. (Investopedia, 2023).

Contrary to what the research claims, decision makers frequently re-use strategies that have proven to work in the past (Available heuristics), so a negative correlation between years of experience and heuristics shows that decision makers become less reliant on such shortcuts as their experience grows in mining industry (Audi et al., 2000).

Correlations						
		Statistic				
Variable	Variable	Correlation	Count	Lower C.I.	Upper C.I.	Notes
Years of experience category	Sens of control	-,020	8	-,715	,694	
	false sense of control bias	-,504	8	-,892	,312	
	Small number bias	-,184	8	-,787	,598	
	Planning fallacy	-,348	8	-,845	,472	
	Framing	-,150	8	-,773	,620	
	Representative Heuristics	-,184	8	-,787	,598	
	Available heuristics	-,090	8	-,747	,656	
Missing value handling: PAIRWISE, EXCLUDE. C.I. Level: 95.0						

Table 4.5: Correlation between bias/heuristics and years of experience in the mining industry

4.2.5.1 Hypothesis 2

The researcher hypothesises that the age and experience of decision-makers influence the level of biasness and heuristics during equipment selection.

Research indicates that the more years of experience one has, the more likely one is to rely on heuristics and biases. With more experience comes less reliance on heuristics and biases, as evidenced by the inverse correlation. This finding, however, runs counter to the findings of the research conducted by Audia et al., (2000), who found that managers tend to recycle the same working strategies over and over again, and that this is something that can only be done by those with extensive experience. Consequently, the opposite is true: as one gains experience, they become less susceptible to relying on heuristics and biases.

4.5 Conclusion

Decision-making skill predicts good diversity among decision-makers and general decision-making results (Stanovich, 1999). Cognitive bias and heuristics capture domain-specific decision-making processes and predict

restricted outcomes (Teovanović et al., 2015). Heuristics and biases were examined during mining equipment selection in this study.

The researcher observation that all heuristics and bias measures showed a satisfactory level of reliability from a descriptive statistic. Most cognitive bias/heuristics measures were significantly and positively correlated to the level cognitive ability (Knowledge), however negatively correlated to years of experience in the mining industry supporting the idea that cognitive bias and heuristics are related to but distinct from intelligence (Luan et al., 2019).

Furthermore, while one may plausibly infer that cognitive bias/heuristics like availability and framing indicate the overreliance on the intuitive answer, it is harder to figure out how these biases could predict negative or positive equipment selection decisions.

5 CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

The overarching goal of this research was to learn how cognitive bias and heuristics influence the choice of mining equipment on platinum mines in Rustenburg, South Africa. The study's goals were developed to provide a road map for identifying the factors that encourage decision-makers to use their rational faculties. The process of making a choice when you don't have all the information you need and are feeling rushed was mapped using a theoretical framework based on research into human behaviour and decision making. Study findings and suggestions are presented here.

5.2. The research learnings

5.2.1. The research questions.

The question explored multiple dimensions, including how cognition and years of experience on platinum mines affects the decision-making during mining equipment selection. The other point that the study was to establish, is the effects of cognitive bias and heuristics while decision maker is making strategic decision (Mining Equipment selection). These were discussed in section 4 of the report, after the results were reported. The study also examined the potential correlation between educational level, bias, and heuristics, and reported its findings, under the section labelled "research objective," more detailed discussions of the study's findings are provided. The research question was therefore addressed.

5.2.2. Objectives of the research

5.2.2.1. Objective 1

The first objective of the study was to identify if there are heuristics and biases during mining equipment selection. Table 4.5 shows the frequency of various heuristics and biases that are prevalent during decision making. All decision-

makers do use the mental shortcuts (Heuristics and biases) in some form or another (Baron 1998).

5.2.2.2. Objective 2

The second objective was to determine if managers and decision-makers in the mining industry develop a preference for particular pieces of mining equipment as a result of their years of experience in the field. It was found that experienced decision makers did not rely heavily on heuristics, in fact there is a negative correlation between years of experience, heuristics and bias. That shows that those who are experienced in the mining industry are less reliance to heuristics and bias. However contrary to the study by Audia et al., (2000) where they say organisations frequently re-use strategies that have proven successful in the past, and managers can only re-use the strategies as they gain experience.

5.2.2.2. Objective 3

The third goal was to identify the types of cognitive biases and heuristics that are most common in the decision-making process. Constrained rational decision-making is the norm due to limited resources and constant time constraints. the study by Artinger et al, (2015) mentioned few fast and frugal heuristics and bias that are prevalent during decision making which are: Overconfidence bias, the law of small numbers, the false sense of control, the planning fallacy, representation heuristics, framing heuristics and available heuristics. Table 4.5 also shows that during equipment selection the decision makers do find themselves under heuristics and bias. In the literature review the research shows that decision makers rely on heuristics and base biases more often than they realize. These facilitate the decision maker's ability to act swiftly in light of his or her knowledge and experience.

5.2.2.3. Objective 4

The fourth objective was to find out if the cognition level and educational level of the decision maker leads the decision maker to use more heuristics and biasness. The research shows that the level of education helps the decision maker to make an informed decision. There is correlation between cognition (Knowledge) level and the usage of cognitive biases and heuristics. The other point that the study shows is the mine managers relay more on Available heuristics as compere to the other heuristics.

5.3. Limitation of the research

The study has limitations. See Figure 4-1 for the small sample of mine managers who could participate. Black men dominate the demographics. Significant limitations included time restraints and difficulties in communicating with key personnel at different Rustenburg mines.
This is because most of the interviews were done primarily through mine visits, which was time-consuming and inconvenient for certain mining sector decision makers. Hence, the researcher could not include as many people as desired due to time constraints. For future research, a bigger, more representative mining community sample is advised.

This study's findings may reflect the factors that influence decision makers with high cognition and experience. Because that equipment selection is seen by some participants as a strategic decision and a process that requires diverse consideration and thus takes time, most organizations need experienced participants to fully implement and evaluate their strategies.

The importance of the following aspect in the selection of mining equipment, such as the mining cooperative's office, equipment planner for mining operations, necessitates further study that includes a wide range of mining professionals with varying levels of competence and years of experience.

Throughout the literature review, it was found that academic research on human behaviour during mining equipment selection is scarce. Therefore, this study cannot be compared to other research on cognitive bias and heuristics in mining equipment selection.

This was a challenge for this study, but it also opens up interesting avenues for future research, and hopefully the current work can serve as a foundation for such investigations. Although the pre-test pilot was conducted in a small scale to determine the feasibility of the study before its start, this study's limitation is that it only focuses on the effects of cognitive bias and heuristics on mining equipment selection on platinum mine and does not allow other mine staff workers who are not Shaft Engineers, Engineering Managers, and Procurement Managers to provide their perspectives. The small number of participants limits the study compared to a larger scale, which is time-consuming.

5.4 Recommendations to the mining industry

The literature is limited on the effects of cognitive bias and heuristics during mining equipment selection the literature also limited to the ecological evaluation regarding mining equipment selection process. As the study shows that there is no standard procedure that is used to select mining equipment across the mining communities however there are more studies and literature regarding analytical method that are used to select mining equipment. The other point that come out from the is that heuristics and biasness are part of decision making.

It then recommended to the mining industry to develop the mining equipment selection process and appoint the strategic team that will be responsible for mining equipment selection and also to be able to standardise on major equipment components like engines, axles and many other high value spares that is fitted on the mining equipment's.

5.5. Conclusion

In general Decision-making requires competency especially the strategic decision and selection a suitable equipment for the mining operation could be a challenge for mine mangers. Cognitive bias and heuristics are rather domain-specific, (e.g., engineering, procumbent and mining) they capture very specific decision-making processes and thus predict narrow decision-making. The current study finding are in line with the literature reviewed and it is clear that decision maker will always have a form of heuristics and biases that affects their judgement.

The research also showed that heuristics and bias can fast track the decision making but those who have high level of education can limit the irrational decision that comes heuristics and bias. Decision maker need to be aware of the pit fall of heuristics and bias and develop a way of evaluating their decision.

Indeed, while one could reasonably assume that cognitive bias/heuristics such as availability and framing predict the overreliance on the intuitive answer in the cognitive bias and heuristics, it is more difficult to figure out how these cognitive and heuristics bias could predict negative or positive decision making during equipment selection process.

5.6. Suggestions for further research

There are more analytical studies that are available in body of literature and there is a limited phycological study that is available to guide the mining personnel on how to select mining equipment. The future research that could add to the body of literature is to combine the analytical and phycological theory of selecting mining equipment.

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APPENDIX A

PARTICIPANT INFORMATION SHEET

Effects of cognitive biases and heuristics during mining equipment selection, by platinum mines in Rustenburg South Africa.

Hello,

My name is Thabo Ramaphakela. I am a post graduate student registered for the degree, Master of Business Administration at the Faculty of Commerce, Law, and Management at the University of Witwatersrand. As part of the requirements for the degree, I am conducting research regarding the Effects of cognitive biases and heuristics on mining equipment selection, on platinum mines in Rustenburg, South Africa. I, therefore, would like to invite you to be part of the study as it is aiming at obtaining an in-depth understanding of the effects of cognitive bias and heuristics during mining equipment selection on platinum mines in Rustenburg.

If you accept my invitation kindly note that your participation in this study is voluntarily and should at any stage of the study wish to terminate your participation you can do so as there are no penalties. There are no consequences or personal benefits. If you agree to take part, I will arrange to interview you at a time and place which best suits you. The interview will last approximately 1 hour. If you choose to participate, you may withdraw from the study at any time and you may refuse to answer questions that makes you feel uncomfortable. If you decide to participate, I will ask your permission to tape-record the interview.

No one other than the researcher and the supervisor will have access to the tapes. The tapes will be kept in a safe place where there is a lockable drawer and will be kept for two years following any publication or six years if no publications emanate from the study. A copy of your interview transcript without any identification information will be stored permanently in a lockable cupboard and may be used for future research.

If during the study you need counselling, I have arranged with the relevant department, phycologist to render counselling for free. Please be assured that your name and personal details will be kept confidential, and no identifying information will be included in the final research report. The results of the research may also be used for academic purpose (including books, journals and conference proceedings) and a summary of the findings will be made available to participants on request.

Please contact me on 0829026466 or tramaphakela@gmail.com, or my supervisor Prof Anthony Stacey, Anthony.stacey@wits.ac.za if you have any questions regarding my study. If you have any concerns and complaints about the study, please contact Human Research Ethics Committee (Non- Medical)contact details: Chairperson: Jaspe.Knight@wrhi.ac.za or the administration: Mrs Shaun Schoeman on 011 717 1408 / Shaun.Schoeman@wits.ac.za . Thank you for taking the time to consider participating in the study.

Yours sincerely

Thabo Ramaphakela

APPENDIX B

CONSENT FORM FOR PARTICIPATING IN THE STUDY

Effects of cognitive biases and heuristics during mining equipment selection, by platinum mines in Rustenburg South Africa.

I hereby consent to participate in the research. The purpose and procedures of the study have been explained to me.

I understand that:

- my participation is voluntary and that I may refuse to answer any questions or withdraw from the study at any time without any consequences.
- There are no foreseeable benefits or risks associated with participation in this study.
- I understand that my responses will be kept confidential.
- My identity will be kept strictly confidential, and any information will be stored permanently in a locked cupboard and may be used for future research.
- I understand that my responses will be used in the write up of an honours project and may also be presented in conferences, book chapters, journal articles or books.

Name of Participant: _____

Date: _____

Signature: _____

CONSENT FOR AUDIO-TAPING OF THE INTERVIEW

I hereby consent to tape-recording of the interview. I understand that:

- my confidentiality will be always maintained and that the tapes will be destroyed two years after any publication arising from the study or six years after completion of the study if there are no publications.
- The recording will be transcribed and any information that could identify me will be removed.
- The transcript with all identifying information directly linked to me removed, will be stored permanently, and may be used for future research.
- Direct quotes from my interview, without any information that could identify me may be cited in the research report or other write-ups of the research.

Name: _____

Date: _____

Signature: _____

APPENDIX C

DEMOGRAPHICS INTERVIEW SCHEDULE FOR THE PARTICIPANTS

Effects of cognitive biases and heuristics during mining equipment selection, by platinum mines in Rustenburg South Africa.

1. Age
2. Gender
3. What is your employment status (contract) or (permanent) worker?
4. Position held (entry level) or (Intermediate level) or (Senior management level)?
5. What are your years of experience?
7. Which department do you work in?

APPENDIX D

INTERVIEW/DISCUSSION GUIDE FOR THE PARTICIPANTS

Effects of cognitive biases and heuristics during mining equipment selection, by platinum mines in Rustenburg South Africa.

1. Does your organisation have a mining equipment selection process? If yes, can you explain how it works? If not, why does your organisation not have one?
2. Does equipment selection form part of a strategic decision? If yes, why is it part of the strategic decision? If not, why aren't you making it a strategic decision?
3. Would you change a process that works, or will you look for an opportunity to improve it, and why?
4. Are you a consultative person during decision-making, and why?
5. Do you like attending seminars and reading research papers?
6. Are you interested in innovation? Do you take the time to learn how it works?
7. If the innovation can add value to your way of doing business, would you adopt it and why?
8. How many brands of mining machines have you used in your career, or do you know about any?
9. Out of those brands, which one is your favorite and why?
10. What was the last mining equipment that you used, and can you describe its performance?
11. Would you recommend using this brand again, and why?
12. Which of your listed brands of equipment is the best, and which one is the worst?
13. When last did you use any of the brands, and how would you rate their performance?
14. Would you hold a supplier/Brand responsible if you had one bad experience with them?
15. Which of these brands of mining machines would you use again, and why?
16. Would you give a previously worse brand a second chance? If yes, why?
17. If the worst-performing brand comes to you and says they've fixed all the problems or made the equipment better, would be skeptical.
18. Have you advocated for a specific brand based on your experience, and why?
19. Have you rejected or even advised someone not to use a certain brand because of your own experience, and why?
20. Would you agree to a certain brand if one or two of your coworkers recommended it, and why?
21. When a brand's representative changes now and then, do you remain loyal to the brand of the former representative?